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DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Disease Control and Prevention

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Agency Forms Undergoing Paperwork Reduction Act Review

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Proposed Project

Virtual Reality to Train and Assess Emergency Responders - New - National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC).

Background and Brief Description

NIOSH, under P.L. 91-173 as amended by PL 95 -164 (Federal Mine Safety and Health Act of 1977), and PL 109-236 (Mine

Improvement and New Emergency Response Act of 2006) has the responsibility to conduct research to improve working conditions and to prevent accidents and occupational diseases in underground coal and metal/nonmetal mines in the U.S.

The turn of the 21st century started with much promise for the coal mining industry. Because there was only one underground disaster in the 1990s, it seemed that emergency response in the United States no longer needed to be a top research priority. However, major coal mine disasters between 2001 and 2010 have resulted in 65 fatalities. These events highlighted the critical need to balance investments to reduce low probability/high severity events with those that focus on frequent, but less severe injuries and illnesses.

The present research project seeks to determine optimal use of virtual reality (VR) technologies for training and assessing mine emergency responders using the Mine Rescue and Escape Training Laboratory (MRET Lab). Responders include specially trained individuals, such as mine rescue or fire brigade team members, and also managers and miners who may either be called upon to respond to an emergency situation or engage in self-protective actions in response to an emergency. This project is a step toward determining how new immersive virtual reality technologies should be used for miner training and testing in the US.

The project objective will be achieved through specific aims in two related areas as illustrated below.

Training assessment

1. Evaluate four training modules
2. Evaluate participant reactions
3. Develop guidelines

Training development

4. Use 3D technologies to develop a prototype for a mine rescue closed-circuit breathing apparatus (e.g., Dräger BG4) .

To accomplish these goals over the life of the project, researchers will utilize a variety of data collection strategies, including self-report pre-and post-test instruments for assessing trainee reaction and measuring learning. Data collection will take place with approximately 150 underground coal miners over three years. The respondents targeted for this study include rank-and-file miners, mine rescue team members, and mine safety and health professionals. A sample of 150 individuals will be collected from various mining operations and mine rescue teams which have agreed to participate. All participants will be between the ages of 18 and 65, currently employed, and living in the United States. Findings will be used to improve the safety and health of underground coal miners by

assessing the efficacy of immersive VR environments for teaching critical mine safety and health skills.

To assess learning as a result of training, each participant will complete a pre-training questionnaire, a post-simulation questionnaire, and a post-training questionnaire. Participants evaluating the closed-circuit breathing apparatus training will only complete a version of the pre-training questionnaire. There is no cost to respondents other than their time. The total estimated annual burden hours are 32.

Estimated Annualized Burden Hours

Type of Respondent	Form Name	No. of Respondents	No. Responses per Respondent	Average Burden per Response (in hours)
Dräger BG4 participants (i.e., closed circuit breathing apparatus training participants)	Pre-Training Questionnaire	30	1	3/60
Mine Rescue participants	Pre-Training Questionnaire	60	1	3/60
	Post-Simulation Questionnaire	60	1	3/60
	Post-Training Questionnaire	60	1	3/60
Mine Escape participants	Pre-Training Questionnaire	60	1	3/60
	Post-Simulation Questionnaire	60	1	3/60
	Post-Training Questionnaire	60	1	3/60

Mine Escape/Longwall Mining participants	Pre/Post- Training Knowledge Test	30	1	6/60
Mine Escape/Continuous Mining participants	Pre/Post- Training Knowledge Test	30	1	6/60
Mine Rescue/Longwall Mining participants	Pre/Post- Training Knowledge Test	30	1	6/60
Mine Rescue/Continuous Mining participants	Pre/Post- Training Knowledge Test	30	1	6/60

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